Outermost Technology

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Services for Solid-State Drive (SSD)

Materials Analysis

Reliability Testing

Failure Analysis

Reverse Engineering

WHY WORK WITH US?

Affordable Price
Up to 40% lower than industry pricing

Free Consultation
Before and after service

In-Depth Data Interpretation
As a second opinion to yours

Quality Assurance Program
Free remeasurement* if not satisfied
*Applies to selected services

RELIABILITY TESTING FOR SSD FROM GIGABYTES TO PETABYTES

Thermal Tests	Arrhenius equation solution and MTBF prediction, data retention, burn-in, high/low temperature test, non-operating temperature cycling, operating temperature cycling
Mechanical Tests	Bend, drop, tumble, torque, end cap separation, USB connector mating cycling, shock, vibration
Environmental Tests	Radiation, electromagnetic compatibility, electromagnetic interference, electrostatic discharge, operating high humidity test, magnet, altitude, dust, waterproof
Other Tests	Bath-tub analysis, sample size determination, DFX, FMEA, RDT/ORT, SCM, ARR/AFR, Weibull analysis

FAILURE ANALYSIS FOR SSD

Analysis Tools	Description	Function
Microscope	3D X-ray, AFM, C-SAM, OBIRCH, SEM, TEM...	Fault isolation and imaging
Tester	Curve tracer, oscilloscope, TDR…	Probing nodes, verify electrical signal, SI
Deprocessing	FIB, parallel lapping, x-section…	Further FA, binary search
Software	Commercial debug system	Find software and firmware issues
S.M.A.R.T.	Find specific data from rotating SSD related to the failures and reliability	
FA Engineering Report	Comprehensive document for root cause, trouble shooting, corrective action & continuous improvement	

Reliability Testing for Solid-State Drive (SSD)

*Test conditions may vary depending on customer's requests.

Mechanical Test	# of Samples	Standard	Conditions
Shock	6	MIL-STD-901D	1500 G, 0.5 ms, 1/2 sine wave, 5 shocks, 6 directions
Vibration	6	MIL-STD-167B	(20 Hz - 80 Hz/1.52 mm)/(80 Hz - 2 KHz/20 G)/3 axis 30 min each
Bend	3	MIL-STD-1600-1699	Force = 20 N, X and Y axis
Drop	3	MIL-STD-810G	Drop tube or equivalent: 1.5 m, 6 faces, and 2 drops per face
End Cap Separation	3	N/A	Test to failure
Torque	3	MIL-STD-1312/31	Torque = 30 Nm, CW and CCW
Tumble	3	MIL-STD-202, METH 203C	Fall height = 500 mm/drop rate, 10 per min, duration = 2 hrs
USB Connector Mating Cycle	3	N/A	Test to failure

Thermal Test	# of Samples	Standard	Conditions
Temperature Cycle (Client)	6	MIL-STD 810, method 503	-40 °C - 85 °C, ramp 5 °C/min, 500 or 1000 cycles
Temperature Cycle (Enterprise)	12	MIL-STD 810, method 503	-40 °C - 85 °C, ramp 5 °C/min, 500 or 1000 cycles
4 Corners	20	MIL-STD 810, method 503	-5 °C - 75 °C, ramp 3 °C/min, 168 or 500 hrs
HTOL	6	MIL-STD-810, METH 501	Real time failure capture when Tj = 125 °C, 1000 hrs
LTOL	6	MIL-STD-810, METH 502	Real time failure capture in -65 °C, 1000 hrs
Damp Heat Exposure	6	Telcordia, GR-63-CORE, Issue 4, Sec 5.1.1.2	23 °C - 85 °C, ramp 20 °C/hr, 85% RH, sock 168 hrs or 500 hrs, in high RH chamber

Environmental Test	# of Samples	Standard	Conditions
Altitude	3	IEC 60068-2-13	-65 °C -150 °C, vacuum pump controls pressure
Dust	3	MIL-STD-810, METH 510.6	Ambient and 71 °C, RH max 30%, standard air velocity, units cap on, multiple faces, 6 hrs each temperature
EMI	3	EMI (FCC/CE/BSMI/C-Tick)	FCC Part 15, Class B/EN55022 - EN55024/etc.
ESD	3	EN61000-4-21	HBM, MM, CDM, and TLP
Waterproof	3	MIL-STD-810, METH 512.6	Procedure 1, option 3, 64 °F/18 °C, 1 m depth, 30 min
Magnet	3	ISO764: 2002	4800 A/M - 3 orientations (X, Y, Z) 1 min each
Radiation	3	ISO7816-1	1 Gy relative to medium energy 40 to 100 Kv

Other Services	# of Samples	Standard	Conditions
FIT	Based on test plan	MIL-HDBK-217	Failure in time
FMEA	0	MIL-STD-1629A	Evaluate severity, occurance, detectability, and calculate RPN
Calculate Acceleration Factor	6	Arrhenius equation	Activation energy, Boltzmann constant, stress temperature/time (160 °C/1000 hrs), and in-use temperature
Predict MTBF	500-1000	MIL-HDBK-217	AF, sample size, test time, and CDF
Check TBW and WAF	Based on test plan	Datasheet	Terabytes read and write amplification factor
Generate Reliability Demonstration Test (RDT) Report and Design Ongoing Reliability Test (ORT) Plan			

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